REMARKS

Prior to discussing the Action of January 10, 2008, applicants would like to thank the Examiner in charge of the application, Examiner Roberts P. Culbert, for the courteous and helpful telephone interview extended to applicants' undersigned representative on April 2, 2008. The substance of the interview is discussed hereinbelow.

Referring, first, to the Action, claims 2, 3, 8, 9, 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kub et al. (U.S. Patent No. 6,323,108; hereinafter "Kub") in view of Otsuka et al. (JP 03-219000 A; hereinafter "Otsuka"). This rejection corresponds to the rejection of claim 4 (the limitations of which are now recited in claim 2) and claims 3, 8, 9, 14 and 15 made in the previous Action of August 15, 2007.

Claim 2 as amended in the response filed November 15, 2007, to the Action of August 15, 2007, recites a manufacturing method of a bonded substrate having a final active layer thickness of 200 nm or less, comprising etching a surface of an active layer on a support substrate, the active layer being a layer formed over the support substrate by cleaving off a portion of an active layer wafer, to control the thickness of said active layer, the etching being carried out using a solution having an etching effect so as to etch

in a range of 1nm to 1μm, the solution being a solution having pH 9 or higher and containing alkaline chemicals and an oxidizer.

In the response filed November 15, 2007, applicants argued that the modification of Kub according to the teachings of Otsuka as proposed by the Office will not result in the method of claim 2 as amended in the response and, specifically, will not result in the etching of an active material layer using an ammonia peroxide mix, but will result only in a first etching [of a substrate layer] down to an etching stop layer using the ammonia peroxide mix. The etching stop layer of Kub must be etched with a different etching solution to provide the bonded substrate having an active layer.

In response to this argument, the Office has taken the position in the Final Action that the first etching step in Kub reads broadly on an etching of the active layer as recited in the claims of the application. This position is understood to be that the etching of an active layer as recited in claim 2 reads on the first etching step of Kub as modified by Otsuka.

It is not clear how the Office is interpreting claim 2 so as to read on the method disclosed in Kub as modified by Otsuka. It appears that the Office may be taking the position that the recitation in claim 2 of the step of "etching a surface of an active layer" does not require that the active layer itself be

etched. I.e., it appears to be the Office's position that etching of a substrate layer provided on an etch stop layer that is provided on an active layer is etching of a surface of an active layer.

Applicants' representative contacted Examiner Culbert for clarification of the rejection. Examiner Culbert explained that his rejection is based on a position that the terminology "active layer" in claim 2 does not have a specific meaning and can be interpreted very broadly. He stated that he does not understand what an active layer is in the context of the claim. He noted that the only positive step recited in claim 2 is "etching" and that the formation of the "active layer" is recited only inferentially. He also indicated that etching is well known in the art relating to the invention. Examiner Culbert suggested amending the claims to recite the method of the invention in positive steps that will help to define the active layer and distinguish the active layer from the etching stop layer of Kub.

Claim 2 has been amended to recite the method of the invention in positive steps based on the description in pages 16 and 17 in the specification with reference to Fig. 1 of the application. Claim 2 as amended recites the method of the present invention in terms of a manufacturing method of a bonded substrate having a

final active layer thickness of 200 nm or less by providing an active layer silicon wafer and a silicon support substrate and carrying out the following steps. A silicon oxide film is formed on the surface of the active layer wafer. A hydrogen ion implanted layer is formed under the silicon oxide film by implanting hydrogen ions in the active layer silicon wafer. A bonded substrate is formed by bonding the active layer silicon wafer and the silicon support substrate so that a silicon oxide film is interposed between the active layer silicon wafer and the silicon support substrate, forming an embedded silicon oxide film. This bonded substrate is heat treated, cleaving away part of the active layer silicon wafer. The remaining active layer silicon wafer on this bonded substrate forms an active layer, and the bonding between this active layer silicon wafer and the silicon support substrate is enhanced by heat treating this bonded substrate after the cleaving. Subsequently, the surface of the active layer of the bonded substrate is etched 1 nm to 1 μm using a solution with a pH of 9 or greater that includes alkaline chemicals and an oxidizer to control the thickness of the active layer of the bonded substrate to the value above.

The amendments to claim 2 are believed to define the active layer and distinguish the active layer from the etching stop layer

of Kub and also, therefore, to distinguish the method of the invention as recited in claim 2 and the claims dependent thereon over that of Kub as modified by Otsuka.

In Kub, the first etching is simple etching of silicon where an etching stop layer (SiGe) coated on the silicon substrate is exposed. The etching of the cleaved surface according to the method of the invention as recited in Claim 2 has a purpose and constitution that is different from that of the etching in the present invention.

That is, any etchant can be used for the first etching in Kub (column 6, lines 49 and 50, of the specification). Conversely, the etching of the cleaved surface according to the method of the invention as recited in Claim 2 must use "a special etchant" to control the thickness of the remaining active layer. The etchant "being a solution having pH 9 or higher and containing alkaline chemicals and an oxidizer (for example, an ammonia/hydrogen peroxide solution)," which is the special etchant, is not disclosed in any of the cited examples.

In addition, the use of this etchant (ammonia peroxide) and etching of the active layer wafer surface after ion implantation and cleavage through heat treatment is not obvious from the prior art. Nothing is disclosed or suggested about this technique in any

of the cited examples. Otsuka only discloses that ammonia peroxide has been used in alkaline etching.

In other words, when cleavage from the ion implantation layer is carried out on part of the active layer silicon wafer in a bonded substrate using heat treatment, the cleaved surface of that active layer wafer becomes rough. This cleaved surface appears as surface (100) and surface (111). Comparing etching rates for surface (111) and surface (100), the ammonia/hydrogen peroxide solution (solution having a pH of 9 or higher and containing alkaline chemicals and an oxidizer) is twice that of an alkaline solution (KOH or the like). The result of this is that the ammonia/hydrogen peroxide solution (solution having a pH of 9 or higher and containing alkaline chemicals and an oxidizer) more selectively etches surface (111), making for an improvement in the roughness of the cleaved surface on the active layer silicon wafer. Therefore, the final roughness of the active layer surface can be improved by using the alkaline chemicals and oxidizer for the etchant.

Furthermore, in Kub, after exposing the etching stop layer (SiGe layer) in the first etching using KOH, this etching stop layer must be etched with a different etching solution. In the invention in the present application, there is no etching stop

layer, so the depth of the active layer remaining is precisely controlled using the ammonia/hydrogen peroxide solution. In Kub, where there is an etching stop layer, etching ends at the etching stop layer no matter what etchant is used, so controlling the thickness using the etchant in this manner cannot be considered. Naturally, no other etching solution is used afterwards in the invention in the present application.

Therefore, the method of the present invention as recited in Claim 2 and the claims dependent thereon is patentable under 35 U.S.C. § 102 and 35 U.S.C. § 103(a) over the cited and other prior art.

Removal of the 35 U.S.C. § 103(a) ground of rejection and a notice of allowability of the claims of the application as amended herein are believed to be in order and are respectfully solicited.

In the event that this paper is not considered to be timely filed, applicants hereby petition for an appropriate extension of time. The fee for any such extension and any additional required fees may be charged to Deposit Account No. 111833.

Respectfully submitted,

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